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Spectro-polarimetry of the two sides of Saturn's moon Iapetus

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Abstract

The polarimetric phase function of the reflected sunlight of atmosphere less solar system bodies provides information about the physical properties of the surface. We are assessing the light scattering of organics in space vs that of a typical surface water ice by polarimetric measurements of the bright trailing and of the dark leading hemispheres of Saturn's moon Iapetus. The dark side is covered by organic compounds related to polycyclic aromatic and aliphatic hydrocarbons [2], and thus offering a sample of organic dark material that may be representative of dark material found in many other environments throughout the solar system, while the bright side is mostly covered by water ice [3].
As a continuation of the previous measurement results [1], here we present linear polarimetric measurements of the two sides of Iapetus, that were carried out at ESO VLT using the FORS2 instrument, from 2009-2011, at five different phase angles (see Table1), along with measurement of circular polarization of the bright side obtained at one observation epoch. Our measurements show that the absolute value of the degree of negative linear polarization of the bright hemisphere of Iapetus decreases with increasing phase angle, in the range 0.8 - 5.2°, varying from -0.9% to -0.3%. For the dark hemisphere, the polarimetric phase function behaves exactly the opposite, in the range 0.4 - 6.0°, reaching a minimum at around the end of the accessible phase angle range from the ground. The interpretation work for the observed polarization in terms of the physical mechanisms is underway, and is foreseen to yield grain parameters information on the light scattering of water ice and that of organic rich surfaces in the solar system.

Table 1: Date and phase angle α, during maximum elongation of the Western Bright (WB) and Eastern Dark (ED) hemispheres of Iapetus, covered in our observation.

Epoch	Hemesphere	$\alpha(^\circ)$
2009 04 04	WB	2.87
2009 05 17	ED	5.87
2010 02 22	WB	2.99
2010 03 25	ED	0.42
2010 05 04	WB	4.31
2010 06 10	ED	6.0
2010 07 25	WB	5.2
2011 02 12	ED	4.78
2011 03 28	WB	0.77
2011 05 09	ED	3.37

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References

[1] Ejeta et al. 2010 EPSC Abstracts Vol. 5, EPSC2010-205, 2010 European Planetary Science Congress 2010.

[2] Cruikshank et al., 2008, Icarus 193, Hydrocarbons on Saturn's satellites Iapetus and Phoebe.

[3] Fillachione et al., 2007, Icarus 186, Saturn's icy satellites investigated by Cassini-VIMS.I. Full-disk properties: 350 5100nm reflectance spectra and phase curves.